THE MEANINGS OF SPACE FOR DESIGNERS

by

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CHAPTER I

INTRODUCTION AND PURPOSE

The interior designer is concerned with design of the environment. This involves responsibility for the ordering of many physical and psychological elements which compose the total "interior" environment for individuals. "Interior" environment is limited to the interiors of physical structures. However, it must be recognized that a clear separation between what constitutes the "physical" and the "psychological" elements of environment is virtually impossible. Theoretically, for the purpose of discussion, the physical elements of environment are such phenomena as space, light, sound, color, and temperature. Psychological elements in man's environment are attributed to man's perception of his environment. And in the background of man's perception lie such factors as the complexities of his culture, his social patterns, and his ideas of what is or is not esthetic. Just how the perceptual processes and the physical phenomena interact is a never-ending circle of relationships. Man's total idea of his environment is actually an overlapping and interpenetration of infinite "physical-psychological" relationships. It is difficult, therefore, to choose a limited and self contained element in the environment which

can be thoroughly studied in itself. And as a consequence, research in this field is either highly selective and somewhat limited in its scope or it is vague and too speculative in its generalizations.

Nevertheless, the interior designer is still confronted with the problem of deciding what particular combination of elements to choose for the fulfillment of an individual's environmental needs. The designer, therefore, must search continuously for more knowledge--knowledge which will reveal how and to what degree physical conditions of the environment affect the behavior and the well being of man--knowledge of the cultural and historical influences on why man perceives his environment as he does. Furthermore, the designer must be aware of the indescribable interaction between the elements that compose man's total environment--the total entity which is greater than the sum of his individual components.

Physical phenomena such as the way in which the human body responds to heat, light, sound, odors and moisture can and have been measured to a slight extent. Researchers have prescribed a certain comfortable range of temperature, lumens of light for specific visual tasks, air filtration and moisture control. Yet, according to the School Environments Research Project, (17) physical factors have been studied as isolated phenomena, with their effects on individuals measured in physical tolerance levels. Knowledge of how environment as a totality affects man is not yet available. Professor Handler in connection with

the SER Project states: "It is an astonishing fact that the problem of human requirements has received less attention than other kinds of building research . . . a substantial body of folklore has come into existence and the art of pretentious know-how has flourished. But scientifically grounded knowledge about the effects buildings should have on their inhabitants seems to be minimal . . . buildings are designed for people, and an understanding of what you are designing for should be the first order of business."(17:11) The knowledge of how environment as a totality affects man may never be available. Only specialized studies are undertaken, but through the fitting together of bits of information from each study, a more complete idea of how man is affected by his environment may be formed.

Knowledge as to the degree physical environment affects human comfort and whether or not some factors are more important than others has only in recent years been the subject of serious interest. Numerous books and articles on design have been written by architects and interior designers who state that one fundamental reason for good design is the great effects that it has on the way human beings behave. A few examples of such statements are given below.

Agan and Luchsinger(1) have stated in their book, The House, that the "houses in which we all live and which we all probably take very much for granted actually exert a powerful, if unconscious, influence on our everyday experience of family living."(1:3)

Irving Rosow(28) states that the housing and planning ideology has rested on the premise that through the manipulation of the physical environment, social patterns can be controlled--i.e., the choice of friends, family adjustments and how people spend their time. "The problem of the housers is to learn more about how and in what way factors of design do indeed affect patterns of social life."(28:271)

Geoffrey Scott(18) states that "space affects us and can control our spirit; and a large part of the pleasure we obtain from architecture . . . springs in reality from space."(18:168)

Statements such as the above were questioned as to whether or not they were based on scientifically researched facts or on intuition. And due to the impossibility of examining the widely scattered bits of research that have been done in the interest of improving environmental design, only one element of the environment was chosen to study. Thus, the main objective of this paper became focused not on the effects of environment as a whole, but on the effects or possible non-effects of just one factor of man's environment--space. However, it soon became apparent that the word "space" held multiple levels of interpretation according to the particular authors' point of view. The problem then became a search for a more fundamental understanding of what is meant when an architect, a designer, or a researcher speaks of "space."

CHAPTER II

DEFINITIONS OF SPACE

General Definition

Before the effects of space can be examined, a definition of space is required. Webster(19) defines space as: (1) lapse of time between two points in time; (2) a limited extension in one, two, or three dimensions: a part marked off or bounded in some way . . . such as an area set apart for a particular purpose or a shaped volume defined by architectural forms; (3) a three-dimensional entity that extends without bounds in all directions and is the field of physical objects and events and their order and relationships. Funk and Wagnalls definition is focused on the mathematical and philosophical ideas on space. To quote, space is,

> the abstract possibility of extension; that which is characterized by dimension; . . . This conception of space has two principal and connected but largely different forms, according as it is framed to meet the practical demands of mathematics in the geometrical branches, or is made the subject of critical examination from the standpoint of its psychological origin.(6)

The mathematical definition describes space as a three-dimensioned entity--as the experience of our senses with the extensions and

extension-relations of sensible objects. Such space is the basis of Euclidean geometry. The new geometry or non-Euclidean, has developed a theory of a possible four-dimensioned space.

The philosophical view of space accepts the Euclidean three-dimensioned theory. The modern study of Berkeley analyzes the origin of the conception of space through the study of how, by the process of abstraction, the visual, tactical, kinesthetic, and stereognostic senses perceive. Modern philosophy holds three answers regarding how our mental image of space is formed: (1) "The realistic which holds that space is itself some sort of a three-dimensioned, boundless, continuous by vacuous entity, in which extended real beings exist and move. (2) the idealistic, which regards space as the a priori or ideal form given by the mind to all sensuous objects . . . (3) the materialistic and agnostic, which regards space as the impression made upon our minds by things, but concludes that the problem of the correlated reality, like all ontological problems, transcends the limits of knowledge or tenable speculation; that is, space as a reality is inexplicable or irrational."(6)

Space Defined by Place

Albert Einstien(5) believed that the concept of space was preceded by the concept of place. Places were defined by material objects which took up space. Place also could mean a group of material objects. With this in mind, is there a definition of space other than the space which is taken up by material objects? If the answer is no, then

space is viewed as a mere order of material objects. In this order, "empty space" would be meaningless.

Absolute Concept of Space

Einstein(5) goes on by saying that it is possible to think of space in a different way. Suppose a definite number of grains of rice or cherries were placed in an empty box. The box itself is a material object which takes up space--its interior property is an empty space taken up by the cherries or grains of rice. When the cherries or grains are removed, the interior property of the box is empty space. Then suppose that there are other boxes--larger and larger boxes. "This concept of 'space' thus achieves a meaning which is freed from any connection with a particular material object. In this way by a natural extension of 'box space' one can arrive at the concept of independent (absolute) space, unlimited in extent, in which all material objects are contained."(5:xiv) In this framework, empty space exists and an object which is not in space is inconceivable.

Contrasting these two concepts of space we have (a) "space as positional quality of the world of material objects; (b) space as a container of all material objects."(5:xiv) In case (a), there is no space unless there is a material object. In case (b), space is greater than material objects and objects conceived of as existing in space.

Relative Space

Einstein introduces yet another space concept. Within his

theory there is no absolute stationary frame of reference in the universe. "The universe is a restless place; stars, nebulae, galaxies, and all the vast gravitational systems of outer space are incessantly in motion. But their movements can be described only with respect to each other, for in space there are no directions and no boundaries."(2:46) Einstein ruled out the concept of absolute space. Space, therefore, is only relative to the possible ordering of material objects. Without the order, there is no space. The question now is how objects are placed in relation to each other--and which is more influential: space or the objects to which it relates. Einstein's "field physics" has as its fundamental belief that the crucial factor is "neither the charges nor the particles, but the field in the space between the charges and the particles."(25:156) Frank Lloyd Wright expressed the same belief in architecture. "Interior space is the only reality of a building."(25:156) Applied to architecture and particularly to interior space, Einstein's law of relativity implies that "the predictable rules of geometry and mechanics, of light, heat and sound must be applied not only with reference to each other, but with reference to human needs."(25:155)

Relativity can be further explained in the example of how space includes more than length, width and height. Phenomenen such as light are usually thought of as existing in themselves. According to Giedion, (8) space is an emotional experience produced by the senses of sight and touch. In order to have sight, there must be light. Light, therefore, becomes an essential element in the formation of space . . .

To the observer many elements that compose the formation of space . . . straight or curving lines, planes, structures, massivity, proportions, forms of all kinds . . . can not be seen individually, but collectively. For example, (25) in the office building of the American Stove Company, an uninterrupted glass strip runs along the north side of the building and provides an excellent natural light. The ceiling acts as a giant diffuser and reflector. If the strip had been divided into partitioned sections, the total light would have been of a different quality and in different quantity. If the ceiling had been painted a dark color, it could not have functioned as a giant reflector and instead would have been broken up with glare and shadow by the light. In each possibility, the office space would have differed because of the way light and color was handled. It is obvious that the way space looks is dependent on other factors and is therefore relative.

CHAPTER III

SPACE IN ARCHITECTURE

Architectural Definition of Space

So far, three types of space have been discussed; type (a) space defined by objects; (b) space as an absolute; and (c) space as being relative to other objects and other phenomena. These three space concepts appear to be strikingly similar to the spatial conceptions described by Giedion in the history of architecture. Giedion's definition of space is as follows: "It is possible to give physical limits to space, but by its nature space is limitless and intangible. Space dissolves in darkness and evaporates in infinity. To become visible, space must acquire form and boundaries either from nature or by the hand of man."(8:494) According to Giedion,(8) the essence of space lies in the interaction of the elements that confine it. When man erects barriers to form a building, external and internal space is created by the physical components of walls, windows, and ceilings and roofs. The walls and roof set boundaries to make infinite space finite. Inside the boundaries, the space is further defined by setting more physical boundaries . . . partitions, screens, and doors and other visual barriers.

The space that is left surrounding the outside of the structure is given a definition and becomes a part of the natural landscape of the urban scene. The way man thinks about space and himself in space is indicated by the way man constructs spaces around himself--the man-made spaces.(8) Giedion(8) states that the relationship between man and man-made space appears in man's conception of space. He describes three basic spatial concepts in the history of architecture; all of which are instinctive and have found concrete expression in the way man has placed dimensional objects in relation to one another. Since man is unconscious of his own space conceptions, the rational study of how man has constructed and defined the spaces surrounding him are indicated in man's buildings. Giedion(8) believes that architecture reveals man's attitude toward the cosmos, toward nature, and toward eternity.

The history of architecture, says Giedion, (8) has had only two major space conceptions, and the third is now in the making. The first concept spans from primeval man's idea of the freedom of directions to the high civilization of Greece with its vertical supremacy. The second concept begins with the idea of buildings as hollowed out interior spaces rather than columns or walls that permit only a partial penetration into the structure. The third concept is described from the changing and dynamic viewpoint of the moving observer.

The First Concept of Space

In the first concept of space, Giedion(8) explains man's

primeval space conception as being characterized by its freedom of directions...like Einstein's description of the space which was defined only by the objects which occupied it. Objects were placed in space during the first space conception with no regard to their limits or to their relation to adjacent objects. Prehistoric art was a rock art. Caverns and cliffs offered varied surfaces which had an infinite number of forms and directions. Nature's endless changing surfaces were an essential part of the primeval space conception.

Cavern art with its frequent transparent interpenetrated(8) animals, has been considered in the past as being chaotic, lacking in composition, and appeared to have animals falling or standing on their heads. However, primeval man's freedom of approach to all directions and surfaces is due to his perception of viewing all directions equally; thus, cave art cannot be appraised in terms of vertical co-ordination. The selection of one dominate direction is foreign to both prehistoric and primitive man. "Prehistoric man did not divide the world into components though certain elements became prominent that were never renounced throughout primeval art: multisignificance and transparency, an absence of concern for past and future, and a freedom of disposition within a setting of apparent chaos."(8:437)

Still within Giedion's idea of the first space conception is the development of the dominant vertical and the complimentary horizontal. Giedion(8) places the origin of verticality in mythopoeic thinking. "It

is the most obvious symbol pointing from earth to heaven--from earthly existence to the abode of the gods."(8:440) Vertical forms symbolize a link with invisible powers. Examples are the totem pole, stone monuments in Palestine, square columns of pyramid temples at Giza, Stonehenge and Brittany. Throughout history the vertical remains as a direction organizer--ranging from pyramids to Gothic spires to skyscrapers.

Within the first space conception is also the plane surface found at its highest development in the smooth unbroken sides of the Egyptian pyramids. The immaculate surfaces composed mirrors which reflected the sky, the earth, and eternal motion of the atmosphere. "Their color and form passes through every phase: almost complete dematerialization in the mid-day glare, enormous weightness in the evening shadows, a black triangular place soaring vertically upward in the starlit night."(8:505) Giedion believes that the pyramid was the Egyptians' ultimate expression of the interconnection between the cosmos and human beings: of eternal presence and the temporal change. Uniquely placed on the rim of the desert, the pyramids link the now fertile valley and the eternally sterile sand; life and death--human fate and eternity. The Egyptians built pyramids as objects in space; interior space or box like space was only a secondary product of external space. In the great hypostyle halls of their temples, the interior space was created, but was broken up by a forest of columns. Thus, the interior dimensions or a

box like space could not be perceived. Riegl, who investigated space as a constituent element of visual art, concludes that the Egyptians did not want a hollowed-out interior space. Their attitude toward interior space can be inferred from the scant lighting and the placement of interior columns. Being surrounded by thickly placed plant-like columns does not give the observer the feeling of being within an enclosed, dimensionally measurable space. Rather, the columns are like trees, and the ceiling with its stars painted on a blue ground is like the heavens. All enclosing walls are thus fragmented and do not create a perceived interior volume.

The Second Concept of Space

It is in the Roman period that a second spatial concept,(8) hollowed-out interior space, developed in architecture. Hollowed-out space begins with the formation of an arch. The oldest form of an arch has been found in Eridu and is dated in the fourth millennium. Huts made from reed mats or of a mixture of mats and clay were easier to construct, but were given up for the more direct expression of verticals and horizontals--i.e., rectangular walls and roofs. Since there was no known way of lighting the vault except from its entrance, the early civilizations left it underground. Vaults create a vacuum of empty space inside of the structure and at the same time walls and roofs are integrated into one uninterrupted form. This unbroken line of ceiling and wall obscures the distinction between what is the ceiling and what

is the wall. One overall space is created. The vault in the second space conception was raised above ground. A new way of looking at space seemed to be necessary in order to light the interior of a domed structure with natural light. Light transmitted from the outside to the inside became a significant change in how the interior space was to be perceived. The Roman Pantheon is one of the first examples of the creation of a vast interior space. The effect of the exterior was apparently discounted by the architect. All of the emphasis is on the great domed space and the even distribution of light emitted by a dome with a circular opening in its center.

Janson(13) believes that the golden dome of the Panthenon symbolized the "Dome of Heaven." Imperial Rome was also the first civilization to use vaults for the heightening religious and secular experience. Other Roman structures besides the Panthenon were symbolically related to the cosmos. Nero's "golden house" had a turning dome which depicted the movement of the stars. Hagia Sophia's dome with the band of windows at its base was conceived of as a representation of the canopy of the cosmos.(8) Gothic architecture(13) created the most soaring confinements of interior space in the history of architecture. The distinction of Gothic architecture in relation to its predecessors is its superb feeling of lightness. Not only is the structure made light in the supporting sense--outward pressure of the vaults is contained by the massive buttress visible only on the outside.

The symbolic use of natural light was especially important in the cathedrals. "The 'miraculous' light flooding the choir through the 'most sacred' windows becomes the Light Divine, a mystic revelation of the spirit of God."(13:231)

The Third Concept of Space

The third spatial concept was foreshadowed at the beginning of the nineteenth century. This century acted as a transition period by using all stylistic forms and means of shaping interior space. The third space conception contains elements of both the first and second stages. It has intergrated the two basic elements of volumes in space and the modeling of interior space. Unlike the Rennaisance explorations of perspective in terms of the appearances of objects from a static point of view, modern man is concerned with the nature of space. The natural field of vision is now recognized as being dynamic--the perception of space could not be bound to a single viewpoint. Movement played a decisive role in the perception of space. Movement implies time . . . when walking through space the visual scenes are ever changing . . . they are seen and perceived through a period of time. Paul Klee's "Scene with Running Woman; 1925" incorporated changes in the form of the surrounding space while it was being crossed. The space and the running figure depict this phychic-physical reality as an overlapping sequence of phases. Mathematical analysis of the movement is not yet possible. In the contemporary conception of space, interest is concentrated upon the changing viewpoint of the moving observer; space is

absorbed by the mind in a continuous dynamic movement. Like the concepts found in Einstein's theory of relativity which explains there is no absolute frame of reference in the universe. The third concept of space is therefore dependent on how one element of the environment is related and interacts with the other elements. Dynamic visual units are not perceived as isolated entities, but as relationships.(14) Interior space in the third concept of space no longer focuses on the vaulting which gives the impression of a ceiling and wall. Now, in the third space conception, (8) the vaulted ceilings of some of its most advanced buildings seem to "hover" above the walls, as in the example of LeCorbusier's pilgrimage chapel at Ronchamp, Church of Notre-Dame-du-Haut. In the chapel, the relationships between the curves and counter curves is irrational in comparison to past architecture. "The massive walls seem to obey an unseen force that makes them slant and curl like paper; the overhanging roof suggests the brim of an enormous hat . . ." (13:545) The correlation between the exterior and the interior is concealed. Doors are hidden in the cliffs of the mountain side. Entering the chapel is like going into a secret and sacred cave.

CHAPTER IV

THE PERCEPTION OF SPACE

Perception in General

From the discussion above, space conceptions which are exemplified in the history of architecture appear to have a direct relationship with the way in which man perceives himself and his world. Some of the fundamental questions of the world's greatest thinkers have been and are centered around the puzzle of how man perceives. Gibson(7) explains that perception includes not only the physiology of sensations, but the philosophy of knowledge, as well.

Perception can not be easily defined in a simple manner. Ittelson(12) states that the many definitions of perception are merely reflections from the many phases and emphases of psychology. Perception, up to the present time, still remains a paradox--it is one of the oldest studies within scientific psychology, yet it still has no formally accepted definition. Therefore, a discussion of perception serves the purpose of giving the reader some idea of the complex relationships that the designer must be aware of when creating environments.

Ittleson(12) believes that ". . . perceiving is that part of the process of living by which each one of us, from his own particular point of view creates for himself the world within which he has his life's experiences and through which he strives to gain his satisfactions. The old view of a fixed environment to which organisms must adapt or perish is being rapidly superseded by a view which emphasizes the organism's creative role in shaping his own environment."(12:24) How man perceives his world depends partly on the external stimuli of his environment . . . geographic conditions, cultural heritage, economic and social placement; and yet the kind of environment he strives to create also depends on the kind of psychological world he has created for himself. Therefore, Ittleson says that man's environment includes his own social and cultural systems--along with the capacity for destroying himself and his systems. That is why the understanding of how man perceives his world (his psychological world) is so important. However, Ittelson(12) believes that there are three general approaches to perception in the history of psychology: (1) the phenomenological, (2) the stimulus-response, and (3) the functional.

The Phenomenological Theory

The phenomenological approach has its roots in the belief that there is nothing outside of man's own mind, and all that is thought and experienced is purely within the mind of the perceiver.(12) For example, the idea of a fixed Euclidean space is an inborn capacity of

the mind. The mind, according to the phenomenological theory, is informed by its own preconceptions, not by the sense impressions.(7)

Stimulus-Response Theory

The stimulus-response theory attempts to define perception as the observable characteristics of an external stimulus and the behavior of the induced response.(12) In this approach, man's mind is believed to be blank, and what he knows is actually the product of experience. The stimulus-response theory is concerned with objects and events in the external world. Concepts and ideas are assumed to be learned, not inborn--and "are residue of all the fleeting perspectives of the past."(7:64) According to this theory, man learns that objects are constant in shape and size and color. He interprets his sensations in accordance with the knowledge learned about the object. This theory emphasizes training or learning and provides for a possibility of improvement of perceptual abilities with the accumulation of memories.(7) The functional theory which tries to combine the phenomenological and the stimulus-response resembles yet another approach to perception--the Gestalt theory.(12)

Gestalt Theory

In the Gestalt theory, Koffka(15) presented the problem of how could a perceiver learn about objects if he never saw one. The learning of distinguishing clues as to what the object looks like or feels like cannot

explain how an inexperienced child or animal finally knows what the object is. The theory of association, or the learning of clues is not enough--and according to Gestalt, objects are objective and therefore do not exist for the child until he sees the retinal image of the object. "Seeing" is the process that cannot be explained. Gestalt theorists believe that there is a fundamental process of spontaneous sensory organization. Experience is structured; it comes in a field and, at the very least, there is always a "figure" on a "ground." It is never wholly meaningless, even at the start. Koffa(15) observed that when an object is perceived, the perceiver does not see separately a retinal size and then a distance, or a retinal shape and then a slant; but instead the perceiver sees a "size-at-a-distance" or a "shape-at-a-slant" . . . both of which are seen together . . . form and space are linked together. Now the question in Gestalt psychology is the source of the organization during perception. Some clues on how perception is organized are explained by Gibson(7) in the relation between stimuli and their sources in the environment. Light, sound, and the mechanical energy must be distinguished from the objects that reflect light, emit sound, or come in contact with the skin. The sense organs are stimulated by light, sound and mechanical energy and the perceiver is aware of the objects which emit them. "What excites the eye, for example, is not an even distribution of light but at least one contrast or margin; and not a fixed level of intensity but a change."(7:67)

CHAPTER V

THE RELATIONSHIP BETWEEN PHYSICAL AND PSYCHOLOGICAL SPACE

Physical Space

Richard Neutra(16) in Survival Through Design strongly asserts that man will destroy himself if he does not re-evaluate the kinds of environment he builds for himself. If the kind of physical environment man strives to create is dependent to some extent on the emotional environment he has experienced, Neutra's theories on design need to be considered. In relation to physical arrangements of furniture, Neutra states that a certain placement of objects in a room requires a habitual pattern of movement which in turn forms a kinesthetic pattern. Kinesthetic patterns are physical patterns that may cause emotions such as depression or exhilaration. Architecture in the same sense guides the movements of our eyes, necks, arms and legs. Emotional satisfactions or dissatisfactions may be produced through the experience of moving through architecture.

Neutra(16) goes on to say that the physical impressions which the human organism perceives are based on the laws of gravity and the already fixed placement of our sensory organs. Neutra explains that

ideas concerning space took place before architecture tried to express such ideas. According to Neutra, gravity gives man his awareness of what is up and what is down. This sense of gravity has given meaningful directions to some of man's emotional and sociological experiences concerning space. For example, imagine looking up at the stars in the sky while climbing the stairs of an observatory. At the top of the stairs, there is a huge two-hundred-inch reflector. When the observer bends over to look he is startled. "It makes a most striking, almost terrifying emotional difference to have the sky underfoot."(16:180)

Neutra(16) attributes experiences such as the above as being frightful simply because it is opposed to our past physical sensory experiences. Another example of a space connotation which has psychological basis is the perception of the space in front of one's body as being quite different from the perception of the space behind one's body. It is significant to note that the human species has its eyes in the front of the head, not on the sides or in the back. From this placement of the eyes, a space conception of "ahead" and "behind" is formed in our thinking and feeling. "All things in front can be controlled or tackled; things behind are out of such control . . . "(16:161)

To illustrate the "ahead" and "behind" spatial orientation of man, Neutra gives the example of why St. Peter's in Rome was changed from its original design. Originally designed by Michelangelo and Bramante, the building was to be a pure, geometrical, multiaxial,

domed rotunda. It was ideal and static. The following generation of architects, Maderna and Bernini, redesigned the building to give it one dynamic direction. The approach or gradual forward moving processional "is an immortal part of all naturally founded ritual. In the end, an impressively approachable altar in the background of the remodeled church interior, rather than a geometrical center, was powerfully played up to intensify this human desire to face."(16:162) Maderna and Bernini changed the beautiful free-standing idea of a rotunda by adding a colonnaded foreground and plaza to provide a way for the procession of pilgrims to approach in the direction of the most significant part of the building, the altar. According to Neutra, ritual "will always conform with the tenets of physiological space, with its strong directional accent. Building must follow suit."(16:163)

Psychological Space

Neutra also states that physical space has many associative meanings. One such meaning is the way we feel in a room of a certain size. Small rooms in the winter seem to be cozier and warmer. The truth is that they usually are warmer since they are easier to heat. On the other hand, large rooms with high ceilings are associated with being cool and formal. Since the physical aspect of man's nature directly influences the psychological meanings of places and things, Neutra concludes that the designer's decisions should be based on ever-increasing physiological information.

Another example of the associative meanings of space is in Winston Churchill's(4) decision concerning the rebuilding of the House of Commons. After the bombing, a semi-circular assembly was considered. Churchill strongly disapproved because its shape "enables every individual or every group to move around the centre, adopting various shades of pink according as the weather changes."(4:168) Instead he wanted an oblong chamber separated by a center aisle which he claimed supported the party system. "It is easy for an individual to move through these insensible graduations from Left to Right, but the act of crossing the floor is one which requires serious consideration." (4:169) The second point that Churchill made was over the size of the chamber's interior space. He insisted that it be too small to contain all its Members because the House was usually half empty. Speaking quickly, informally in a conversational style requires a small space. A large, half-empty space would be a damper. And on great occasions it is crowdedness which gives the individuals a sense of importance.

Other physical requirements which have been studied in relation to their psychological implications are exemplified in the studies on the effects of crowding. James Plant(26) studied the effects of crowding on children. He observed that crowding was related to stress and self-perception. Since the children in crowded environments were seldom alone and were constantly exposed to reality, their sense of individuality and a symbolic idealized view of other people often

failed to develop. Another author, Allen Pond(27) states that people need physical as well as psychological space. Children need space to play near their homes. Individual family members need a private space from other family members. Families need to be isolated at will from other families. He concludes that well designed living spaces can reduce mental and physical illness, although the degree of prevention is not yet known.

On the other hand there are those who are concerned that the effort to perfect the physical and psychological environment may result in its becoming sterile. John Buckard(3) states that, "a man who is only warm, safe, and comfortable may forget to ask whether there is any particular point in living the kind of life that no doubt can be enjoyed these days by any hot house tomato or by all the animals in the zoo."(3:15) Another author, Burthan Kelly, says that too much attention is paid to concrete physical needs. Perfect physical environments with no social unrest do not produce creative individuals. Behavioral scientists insist on the worth of continuity of experience, i.e., stable homes and communities. Yet many creative individuals have come from broken families, experienced discontinuity in housing, and have moved from community to community.

Research has indicated that some high levels of stimulus are harmful. Glare in light, levels of noise and stress from crowding are familiar examples of too much stimuli. What constitutes a level

of too much and what constitutes a level of too little stimuli is the question. Vast research will have to be done to find even an approximate answer. Space itself contains many stimuli and thus it is important to analyze its possible effects.

Some of the human requirements have been studied in relation to space. The results of the studies are tabulated into illustrations and charts which specify the number of inches or feet required to move comfortably in space. One example is the Pierce Foundation(25) studies in 1944. Movements were recorded on film and an evaluation of use-space was determined. Examples are the amount of space required for using bureau drawers and the number of inches required to reach an object on a shelf. "Data of this kind must be available before architecture can truly reflect underlying human movement patterns."(25:157)

Psychological Perception of Physical Space

Just how physical and psychological space are related is not easily discernable. However, Erno Goldfinger(20) made observations on how man psychologically perceives physical space. He stated that it is a subconscious phenomenon which varies with the amount of enclosure, the size and the shape of the enclosed space. Claustrophobia and agoraphobia are extreme examples of subconscious effects of space.

According to Goldfinger, (20) if a person stood in the middle of a flat expanse of desert with only the sky and horizon as limiting

factors, the sensation of space would be at a maximum. On the other hand, if a person were totally enclosed in a small closet, the sensation of space would be at a minimum. Architecture utilizes structural barriers that are somewhere in between these two extremes. Like the vast space in the desert and the restricted space inside of the small closet, architecture, in more subtle ways, produces a spatial sensation in the participant.

Physical space(21) can be considered also as pictorial space or as plastic space. Pictorial space is two-dimensional. Looking at a painting, the observer stays in one position. Sculpture is viewed from all sides and the total three-dimensional object is a composite of external viewpoints. However, to view constructed space (architectural space) one must enter into it and move through it. Sculpture and paintings are observed consciously from a relatively fixed position. Architectural interiors are observed and felt through movement. The effect of a free-standing building like the Parthenon is similar to that of sculpture; light and shadow create depth and form--the dimensions of length, width, and depth. The detail drawing of one side of the Parthenon is a two-dimensional problem--it is like a picture with only length and width. However, upon entering the enclosed space inside the Parthenon, the person experiences a spatial sensation which includes width, length, depth and movement. Movement takes time and in time an observer accumulates a series of impressions--impressions which have varied throughout history.

Even though it may be assumed that there is little difference in the functioning of man's visual facilities since historic times, perception of space has apparently changed. An example of how the kinesthetic patterns of movement have changed is shown by comparing the climbing of stairs in a building with going up in an elevator. The impression once gained by a man climbing stairs is now replaced by a man enclosed in an elevator. The elevator completely alters the speed and energy required for moving through space. Going up the stairs, a man uses his own body energy; he sees parts of the walls, ceiling, or windows pass behind his body while new parts of the building are revealed to him. None of these experiences occur in an elevator unless it has a window--and even then the body is carried up and no physical exertion is required. Therefore, it is clear that in the elevator, there can be no concepts of the space that is left behind nor of the space one is passing through. The pattern of impressions gained by moving through space has changed visually. And one can ask, if the impressions which come to man's eye change, do man's ideas of space change?

Functional Meanings of Space

Interior spaces are usually created for purposes other than for walking. They are constructed to serve a purpose.(22) It is the function of the space that is obvious to people within it. Meanings

are associated with the purposes of buildings and the activities and transactions which go on inside. Subconsciously, says Goldfinger, (21) feelings of spaces are intergrated in a person's memories of past experiences in similar enclosures. The smells, the sounds, the personal contacts with other people are all remembered and associated. Places have many different and changing meanings, and their interpretation is tied up in what goes on in a particular space. Spatial enclosures, continues Goldfinger, (22) are also connected with the social and historical events of the times. Social, economical, and technological conditions determine the size and shape of enclosed spaces being built. Theoretically, it is possible to create an infinite variety of shapes and sizes of interior spaces. The fact that only certain sizes and shapes have been created to date is significant.

CHAPTER VI

CULTURAL INTERPRETATIONS OF SPACE

Personal Space

In addition to the physical and the psychological meanings associated with space, a cultural connotation has been recognized. Edward T. Hall(9) observed space as a cultural phenomenon. He first became aware of it when he noticed that different cultures organized their personal space differently. Personal space is defined as the space between one's personal body and the body of another person.(9) One example of how personal space differs from culture to culture is the American in Latin America who was disturbed by people who stood "too close" during conversations. When the American would back away, the Latin Americans would interpret the American's behavior as being cold, aloof, withdrawn and disinterested.(23) Thirty inches may be a comfortable distance for an American, but for a Latin American, it is remote. Each person was acting according to a different set of learned rules which govern the handling of personal space, yet each was probably unaware of the spatial forces acting on him.(23)

United States housewives, when they visited the Middle East,

felt that there was much wasted space in the Arabian houses.(23) Dr. Hall explained that the Arabic people want lots of space inside and a broad, long view of the space outside. The Arab wants to be screened from those outside his household, but not from those inside.

In Japan the personal space is much smaller.(23) People can be closer to each other than they can in America without crossing the invisible personal zone. To the Japanese an appreciation of the visual world is important; if he does not have a view of the outside world, he creates one in a miniature garden which appears to be much larger than it really is.

According to Hall(23) man has developed, without being aware of it, a whole complement of interrelated, culturally patterned, spatial ways of relating himself to other people. Since this awareness is not intellectually controlled and is greatly varied among cultures, he feels that it is worthwhile to investigate how lower forms of life handle space.

E. H. Howard(9) in his studies on "Territory in Birdlife" found that living organisms made claims to a specific piece of land, and sometimes the air above it, and they defend this territory against invaders of their own kind. If an animal has not established a territory, it is more vulnerable to attack. "Territoriality" functions as an ordering factor in an animal's life. Animals often design the uses of space in almost human ways. They have homes and yards, eating and drinking

places, sleeping and bathing places, terraces, nurseries, and places for sex.(9) Along with "territoriality" a concept of "space-distance" is explained by Hediger.(9) He says that animals maintain a certain amount of normal spacing or personal space between themselves and their fellows. Personal distance is like a bubble that surrounds the organism. Outside this bubble, two organisms are not immediately involved with each other. Inside it, they are. The very regular spacing of birds sitting on a wire is an example of the functioning of personal distance.

"Man has elaborated his use of space to such a degree that it is difficult to determine just how space-bound he is."(11:68) As in the case of the Latin American and the American, it can be seen that personal distance in man varies from culture to culture, and may be a cause of discomfort and misunderstandings. People with small bubbles of personal space will get too close to those who have larger spheres. However, Dr. Hall thinks space transcends relatively simple matters of comfort and communication distortions. Too much overlapping of personal space over a period of time can have serious pathological consequences in physiological, social or behavioral spheres.

Besides the phenomenon of personal distance spacing, there is also a flight distance. Animals flee when the distance between them and an intruder reaches a certain point. Hediger(9) observed that lizards fled at six feet; antelopes, at sixty feet; and alligators, at one hundred fifty feet. Like the animals, man also has some non-physical territories which are exemplified in his particular culture.

Transactional Space

Besides personal space(23) there is "transactional" space which is a combination of personal and territorial spaces. Hall says that children in the back seat of an automobile, or in a very small room, have a greater tendency to fight than those who have plenty of room to move about. William F. Whyte(30) in his study, Street Corner Society, shows that gangs tend to defend their own territory. According to Hall, (24) a Washington columnist reported that in a large modern office building of one of the government agencies, supervisors were surprised to learn that professional personnel, who had formerly occupied private offices, were very upset as a result of being assigned to a group work area. This makes the point that many architects and designers are totally unaware of the influence of personal and transactional space on human relations.

"Transactional space" has been studied by Humphry Osmond. (24) He says that enclosed transactional space is either "sociopetal" or "sociofugal." Sociopetal space is space that brings people together, such as the old-fashioned drugstore booth or a cozy conversation corner. Sociofugal space is space that keeps people apart and is found in railroad stations, airports, lecture halls, and some living rooms. Robert Sommer (24) was able to put knowledge of sociopetal and sociofugal space to work. In his study, "Social Interaction in a Geriatrics Ward," the re-arranging of the furniture in an elderly patients' ward caused the conversation to

double and the amount of reading tripled. The arrangement of furniture in the former situation was against the walls, neat, but it isolated the occupants from other patients. Hall(10) warns that what has been found to be sociopetal in one society may be considered as sociofugal in another. Americans have great difficulty carrying on conversations across a room. They feel a need to move closer in order to talk comfortably. However, in the mountain villages of Lebanon and Syria, this is the accepted way for men to converse in the evening. Speaking distances and tones of voice have been associated by Hall as follows:

1. Very close, 3-6 inches	Soft whisper; top secret
2. Close, 8-12 inches	Audible whisper; very confidential
3. Near, 12-20 inches	Indoors, soft voice; outdoors, full voice; confidential
4. Neutral, 20-36 inches	Soft voice, low volume; personal subject matter
5. Neutral, 4 1/2-5 feet	Full voice; information of non-personal matter
6. Public distance, 5 1/2-8 feet	Full voice with slight overloudness; public information
7. Across the room, 8-20 feet	Loud voice; talking to a group
8. Stretching the limits of distance, 20-24 feet indoors; up to 100 feet outdoors	Hailing distance; departures

In another study, Sommer reports on the influence of seating arrangements on table conversation. Fifty observation sessions were

conducted of people sitting at 36 x 72 inch tables in a cafeteria. Side-by-side conversations were three times as frequent as face-to-face conversations. Corner-to-corner conversations were six times as frequent as across the table conversations.

Sommer(24) also demonstrated that apathetic patients in a large mental hospital tended to be in the halls and corridors where the space is sociofugal, five times more than non-apathetic patients, who were observed in day rooms and shops.

Steinzon's(29) hypothesis in his study, "The Spatial Factor in Face-to-Face Discussion Groups," was "seating arrangement in a small, face-to-face group helps to determine the individuals with whom one is likely to interact."(29:552) Steinzon questions whether people respond to positional placements of individuals in addition to the verbal ideas expressed. If a person happens to be in a spatial position which increases the chances of his being in full view to the others, are his ideas received with a greater impact? Social interaction was measured by a group of observers and by the groups themselves. Each person was rated according to the amount of time he spoke and the leadership score given by the participants. The Chi-square technique was used to calculate the significance of the difference between the observed and the expected frequency of discussion. Though there was a significant relationship between the rating on leadership and the person's position in space, the seating position was not the only factor. "The intent and attitude of the speaker in making a particular remark has been shown to be related to

the intent of the statement of the following speaker."(29:553) Yet there was still enough evidence to say that a significant relationship existed between where a person was seated and the amount of participation that he had in the discussion. If a higher level of interaction is desired from specific people, then a leader may place rather quiet persons opposite more expressive persons. Or a leader may have two people who tend to monopolize a discussion sit next to each other.

CHAPTER VII

CONCLUSIONS

It is apparent from the discussions above that space does have many levels of meaning. Physical elements which define space are becoming more significant because of their psychological implications.

The role of the designer is centered around the selection of a particular combination of physical elements and their psychological associations. It now becomes the designers' responsibility to uncover just how and to what extent individuals are physically and psychologically affected by the spaces he designs. With the faster pace of today's world, decisions concerning man's spatial environment are affecting more and more people at an exponential rate. The designer, therefore, must be continually aware of his ultimate function, the fulfillment of human needs.

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